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Network Traffic Analysis and Management

Skladannyi, P.[a], Kostiuk, Y.[a], Sokolov, V.[a], and Khorolska, K.[a]

[a]Borys Grinchenko Kyiv University, Ukraine

Abstract

This chapter explores modern approaches to intelligent network traffic management using explainable anomaly detection and predictive modeling. A mathematical model for predicting network load has been developed using cyclical time series analysis and deep neural networks, which allows for seasonal and trend patterns in network traffic to be considered. Based on the model, an adaptive control methodology has been developed that provides detection, quantitative assessment, and localization of anomalies. Particular attention is given to ensuring the explainability of system decisions through the implementation of Explainable Artificial Intelligence (XAI) and rule-based logic mechanisms in the decision support module. The proposed architecture provides filtering of anomalous traffic, dynamic distribution of computing resources, and optimization of data transmission routes. The functionality of the methodology is demonstrated based on a software prototype that implements key algorithms and allows for the evaluation of the effectiveness of control under variable load and threats. The results obtained are of practical importance for designing adaptive traffic monitoring and control systems in corporate and critical information infrastructures. © 2026 selection and editorial matter, Agbotiname Lucky Imoize, Oleksandr Kuznetsov, Roman Odarchenko and Sergiy Gnatyuk; individual chapters, the contributors.

Author keywords

Anomaly detection; Artificial intelligence; Software prototyping; Time series analysis; Traffic control

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